

ANNOUNCEMENTS

Lori Del Negro received the American Geophysical Union's Outstanding Student Paper Award for her poster on "In-situ measurements of NO₂ in POLARIS: Changes within the reactive nitrogen reservoir." The poster was presented as part of the symposium in honor of the 50th anniversary of the Mauna Loa Research Observatory at the 1997 Fall Meeting of the AGU.



Dan Murphy was selected to receive the 1997 Editors' Citation for Excellence in Refereeing for the *Journal of Geophysical Research-Atmospheres*. The citation recognizes Dan for especially commendable

reviews of submitted papers. He will be presented with the citation at the 1998 AGU Spring Meeting in Boston.



Quick Quiz: What is the connection between (a) the Photochemistry of Ozone Loss in the Arctic Region in Summer (POLARIS) mission and (b) the kitchen in the Building 24 AL Library? Answer: the microwave oven! After successfully serving the mission scientists for the three deployments of POLARIS in 1997, the oven has found a new tour of duty. The donation is appreciated by the many AL lunch-eaters and tea-drinkers who are now benefiting from the extra "kick" provided by this new, more powerful microwave. Thanks!



The Role of Scientific "State of Understanding" Assessments: Interagency Assessment of Oxygenated Fuels

[Note: This is the third in a series of articles summarizing the Aeronomy Lab's current participation in science assessments.]

Aeronomy Laboratory employees participated in the preparation of an Interagency Assessment of Oxygenated Fuels which was published in June 1997 by the National Science and Technology Council Committee on Environment and Natural Resources. This assessment was made under the auspices of the White House Office of Science and Technology Policy (OSTP) at the request of the US Environmental Protection Agency. The EPA requested an assessment of the public health effects of the use of oxygenates in winter gasoline in response to complaints from the public of adverse health effects. OSTP organized an interagency steering committee, which included Dan Albritton representing NOAA, to oversee the project. The committee broadened the scope of the assessment to include Air Quality Effects, Water Quality Effects, and Fuel Economy and Engine Performance in addition to Health Effects. Carl Howard was the lead author on the Air Quality chapter.

The Air Quality issue is of major importance because the Winter Oxyfuel Program is an air quality program. The objective of the program, which began in Colorado in 1988, is to reduce winter carbon monoxide (CO) pollution by blending an oxygenated organic compound into the fuel. The

oxygenate is usually an alcohol or an ether; ethanol and methyl-tertiary-butyl ether (MTBE) are the most common. Gasoline fueled vehicles are thought to account for over 80% of the urban winter CO emissions. The oxygenate is supposed to promote more complete combustion of the fuel and thereby reduce the CO emissions. In 1992 the EPA, under Clean Air Act mandates, required many urban areas throughout the U.S. to adopt oxyfuel programs to reduce the number of winter violations of the CO air quality standard.

The major conclusions of the assessment included:

- Some reduction in CO pollution could be attributed to the use of oxyfuels, but the amount was about a third of what the EPA's "MOBILE 5a" model predicted. The major factor contributing to improving urban air quality is new vehicle technology and cleaner vehicles.
- The oxygenate MTBE is not readily biodegradable and is being found with increasing frequency in the ground water in areas using MTBE in gasoline.
- A reduction in fuel economy of 2-3% is observed and can be attributed to the reduced energy content of oxygenated fuels.
- There are large uncertainties in the effects of oxygenates and their combustion by-products on human health.

—Carl Howard

[Copies of the report are available from Carl.]

Getting Serious about Cirrus

When the ozone hole made its unexpected appearance in the Antarctic, it was Susan Solomon's explanation involving chlorine chemistry on surfaces of clouds (specifically, polar stratospheric clouds, or PSCs) that withstood the intensive data-gathering and hypothesis-testing that followed. The findings marked the beginning of a new era in stratospheric ozone research, one in which scientists now recognize the key role of heterogeneous processes (in which gases interact with solid- or liquid-particle surfaces) in the chemistry of our atmosphere.

Clouds are once again the focus of Susan and colleagues, but this time, the researchers are looking at regions other than Antarctica. The question they have examined is whether the more-widely occurring cirrus clouds could be affecting chlorine-caused ozone destruction near the stratosphere-troposphere boundary (the "tropopause") away from the poles.

What sparks this interest? While major features of the Antarctic ozone loss are now well understood, aspects of midlatitude ozone loss have remained problematic for researchers. For example, the amount of ozone loss observed in the 10-15 km region is not in agreement with predictions of stratospheric models. While this ozone does not make up a substantial fraction of the total ozone column (more ozone resides in the 15-25 km region), it has a significant role as a greenhouse gas. Also, "getting it right" in the models is a key test of our understanding of processes that affect ozone in the stratosphere.

Cirrus clouds occur frequently near the tropopause in nonpolar regions. It's warmer there than in the mid-stratosphere where polar stratospheric clouds form, but there's more water vapor and so cloud formation is promoted. Those clouds likely consist of mostly water, but may also contain trace amounts of sulfuric and nitric acids. Stephan Borrmann (University of Mainz, Germany) took a lead role in the initial studies with Susan and colleagues. Those investigations used a combination of three types of information — ER-2 measurements from the

Airborne Arctic Stratospheric Expeditions (AASE), model calculations of key chlorine-bearing species, and laboratory data — to calculate rates of the major heterogeneous reactions. The investigators found that in the cirrus layers, inactive forms of chlorine (chlorine nitrate and hydrochloric acid) were being converted far more quickly into active forms (hypochlorous acid and molecular chlorine) that then generate ozone-destroying radicals. Susan points out that the whole idea of their studies was Stephan's (in a collaboration that began at a conference!).

A subsequent investigation led by Susan and including Bob Portmann of the AL Middle Atmosphere group has incorporated satellite data (which gave a global cirrus cloud "climatology") in more detailed model studies of how these clouds may impact ozone trends near the tropopause. The model showed that the cirrus events significantly enhance the amount of the primary ozone-destroying species, chlorine monoxide (ClO). The resulting ClO concentration "spikes" are a factor of 5-30 greater than the "no clouds" case and can persist for several days or weeks, long after the dissipation of the clouds. The consequences for the total column ozone are small (an additional loss of 1-1.5%), as anticipated, but the incorporation of cirrus effects brings the calculated amount of ozone near the tropopause into much better agreement with observations. The results, which are highly sensitive to the frequency of cirrus cloud occurrence and hence to season and latitude, indicate that cirrus cloud chemistry probably contributes significantly to trends in ozone (and ozone-related radiative forcing) near the tropopause, especially in summer at northern midlatitudes.

In the intricate web that is our Earth's atmosphere, we may yet find that the role of cirrus becomes even greater if, for example, more such clouds are formed due to increased air travel or because stratospheric ozone depletion causes temperatures near the tropopause to drop. Further research will give an even clearer picture of these "cloudy" issues.



HOME and AWAY

Convection and Rainfall Studies in the "TEFLUN-A" Campaign

Members of the Tropical Dynamics and Climate Program, accustomed to travel in their studies of tropical meteorology and climate in the equatorial western Pacific Ocean, are on the road again. This time, though, they are a little closer to home as they begin a spring field campaign in the Houston, Texas, area. The campaign is associated with a joint US/Japan satellite project known as the Tropical

Rainfall Measurement Mission (TRMM). Launched into orbit last November, TRMM uses space-borne radar, microwave, and infrared sensors to map rainfall characteristics and patterns around the globe. This "flying rain gauge," as it has been called, has a circular orbit at an inclination of 35 degrees to the Equator, enabling researchers to get a first-time global dataset on tropical precipitation over a full 24-hour diurnal cycle.

The TDC group has a vital role in providing ground-based measurements that will be used to intercompare with the satellite data. At sites in Texas and Florida, the TDC group's 915 MHz and 2835

MHz Doppler-radar profilers will "look up" while the satellite passes overhead and "looks down." The Texas-Florida Underflights begin with the spring TEFLUN-A campaign in April-May; work then shifts to Florida for a summer TEFLUN-B campaign in July and August. From late 1998 to mid-1999, plans call for intercomparison campaigns in Brazil and the Marshall Islands in the Pacific.

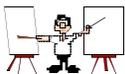
The Aeronomy Lab contribution will be to examine the detailed vertical structure and evolution of convective systems, to help diagnose the precipitation into convective and stratiform components, to obtain an independent measure of rain mass flux, and to possibly retrieve drop-size spectra. Daily profiler data will be available on the Web during the TEFLUN campaigns (www.al.noaa.gov/WWWHD/pubdocs/TRMM.html). The TRMM and ground-truth datasets are expected to give researchers a better handle on the latent heating associated with tropical rainfall, which is one of the primary "drivers" of the Earth's atmospheric circulation. It should help improve the ability of numerical models to represent the hydrologic cycle and thereby improve the reliability of global climate simulations. ♣



WHAT'S UP WITH PEOPLE

George Reid retired from NOAA in February and took up an appointment as a CIRES Senior Research Scientist. He celebrated his "retirement" by taking a 2-year term on the CIRES Executive Committee and chairing the Visiting Fellows' Appointment Committee. George has been with the Aeronomy Lab since 1970, serving as Acting Director from 1970-72 and Senior Scientist since 1986. He began his association with the Boulder federal labs in 1963 (with the National Bureau of Standards and later with the Space Environment Laboratory). He also had a hand in CIRES' earliest days, when in 1968 he was appointed as one of the four initial Fellows of CIRES... **Ray Dayhoff** is working with the Tropical Dynamics and Climate Program assembling wind profiler equipment for experiments that will occur during the spring-fall time frame (see TEFLUN article in this issue)... **Edeltraud Leibrock** is visiting the Tropospheric Chemistry Program, where she is developing a mass spectrometric technique for measuring ammonia. She is with the Fraunhofer Institut für Atmosphärische in Germany... We wish everyone the best in their new endeavors here!

COMMUNICATING OUR SCIENCE



To Decisionmakers: In March, Dan Albritton gave briefings on the Health of the Atmosphere air quality research program to Rep. Ken Calvert (CA) and staffers on the Hill, and also briefed staffers in the office of Rep. Charles Taylor (NC). Dan has also given presentations on the Kyoto Climate Protocol

and the science of climate change to Robert Mallett (Deputy Commerce Secretary), D. James Baker (NOAA Undersecretary for Oceans and Atmosphere), and others in DOC/NOAA. He gave a climate science/Kyoto Protocol briefing also to Congressional staffers at a breakfast briefing arranged by Dr. Baker... Chris Ennis gave a briefing to visiting Congressional staffers in February on the topic of stratospheric ozone depletion.

To the Scientific Community: George Kiladis gave an invited talk on "Equatorial Waves in the Atmosphere" at the Massachusetts Institute of Technology on March 24 and presented an invited paper on the topic of Southern Hemisphere tropospheric variability to the Association of American Geographers Annual Meeting held in Boston on March 25-29... Susan Solomon gave the invitational G.N. Lewis Lecture in the Chemistry Department at the University of California, Berkeley, in February... David Fahey gave an invited seminar at the Physical Chemistry Department of UC-Berkeley in April... Dave Fahey and Dan Albritton participated in the IPCC Aviation Assessment Meeting in Trinidad in February. Dan is on the steering committee of the assessment and Dave is a Chapter Lead Author... Matthew Wheeler presented a paper at the Australasian Atmospheres and Oceans 98 Meeting in New Zealand in February... Adrian Tuck gave an invited talk at the Stratospheric Aerosol and Gas (SAGE) meeting at Hampton University in February... Mike Proffitt gave an invited talk at the International American Institute in Buenos Aires in March... Fred Fehsenfeld, Dave Parrish, and Jim Meagher participated in a January meeting of the Southern Oxidants Study Science Team in Raleigh, NC, where future scientific objectives and plans for the SOS program were discussed.

To Reviewers: Dan Albritton gave an overview presentation on the NOAA Climate and Global Change Program's Atmospheric Chemistry Project at the Climate and Global Change Review Panel's Winter Meeting in February. Ravi and Steve Montzka (CMDL), who are principal investigators with the Atmospheric Chemistry Project, gave research presentations to the Review Panel.

To Constituents: Dan Albritton helped to lead a session of the NOAA Strategic Planning Workshop in February, in which NOAA gathers input from the community on its research goals and plans. Dan's session dealt with NOAA's research on the "Predict and Assess Decadal to Centennial Change" goal of the NOAA Strategic Plan.

To the Public: Ken Gage made a presentation on El Niño to the Gunbarrel-Niwot Kiwanis Club on 14 January... Dan Albritton gave a presentation and answered questions on global warming and the Kyoto Climate Protocol at special Town Meetings on the topic that were arranged by Rep. David Skaggs. Over 100 people were in attendance at the Boulder meeting on March 7, and a crowd of 50 were present on April 4 at the Northglenn meeting... On January 26, Lena Teverovskaia gave a presentation on Java

programming and the World Wide Web at the Colorado Chapter of "Women in Technology."

To Media: Jim Burkholder and Barb McGehan (NOAA-Boulder Public Affairs Officer) hosted the visit of Richard Hoops, Earthwatch Radio, to AL's atmospheric chemical kinetics laboratory in March.

To Students and Teachers: Ned Lovejoy gave a cryogenics demonstration to 3rd and 4th graders at Longmont Elementary School last October. Jim Burkholder also gave the "cold facts" to 4th graders at Louisville Elementary School last November... Mike Proffitt gave a talk about "Weather in Boulder" to 2nd-graders at Boulder Country Day Elementary School in January... Christopher Williams met with 4th, 5th, and 6th graders in the Goleta (California) School District to talk about weather processes, El Niño, and NOAA Web information. He's carried on e-mail correspondence to answer several science questions of the students since his November visits to their classrooms... In April, Susan Solomon visited The American School of The Hague in the Netherlands and gave five talks to students ranging from the 1st through the 10th grades... Christopher Williams and Ken Gage each presented invited lectures in April to a graduate-level meteorology class at Texas A&M University on the topic of the TEFLUN experiments (see article on page 2 of this issue)... "Science fair" season is upon us... and this year, a record number of Aeronomy Lab scientists served as judges:

January: Ryan Sanders (High Peaks Elementary School); Tom Van Zandt (Whittier Elementary)

February: Ken Gage (Fort Lupton Public Schools); Carl Howard (Southern Hills Middle School); Leslie Hartten, Wally Clark, George Kiladis, Chuck Eubank, and Mary Gilles (Eisenhower Elementary School); Leslie Hartten (Horizons Elementary School); Chris Ennis (Boulder Valley School District-wide elementary school science fair, selection of NOAA, NCAR prizes for atmospheric science-related projects).

March: Donna Sueper (Horizons Alternative School).

April: Mary Gilles (State Science Fair, Fort Collins).

To Our Visitors: Ken Gage hosted visitors from NOAA's National Environmental, Satellite, Data, and Information Service (NESDIS) in March. They discussed issues of mutual interest on the topic of tropical meteorology and climate.

Through Service on Scientific Panels and Boards: Dan Albritton has begun a two-year term as Chair of the Tenant Board of Directors of the new NOAA building, overseeing numerous issues related to the transition and early-1999 move-in period. Carl Howard and Roger Jakoubek are serving as the AL liaisons and coordinators for the transition... Fred Fehsenfeld is a member on the National Research Council's Committee on Ozone-Forming Potential of Reformulated Gasoline... Susan Solomon served on the Steering Committee for a meeting organized by the Intergovernmental Panel on Climate Change on the topic of "Rapid Nonlinear Climate Change," held in Amsterdam March 30-April 3. She also

serves as a member of the Joint Steering Committee of the World Climate Research Program (WCRP), which met in Cape Town, South Africa, in March... Ken Gage is a member of the Atmospheric Radiation Measurement (ARM) Science Team... Dave Fahey is on the Steering Committee of the Atmospheric Effects of Aviation panel... Dan Albritton participated in the North American Research Strategy for Tropospheric Ozone (NARSTO) ozone assessment meeting in Mexico City on January 13-16. He is a member of the Synthesis Team of that assessment... Claire Granier is finishing a 4-year term as a member of the National Research Council's Panel on Atmospheric Effects of Aviation. The Panel's report, "Interim Review of the Atmospheric Effects of Stratospheric Aircraft Project: Science and Progress" is currently undergoing review.

DOWN THE ROAD



Throughout April: WB-57F Aerosol Mission (WAM), Johnson Space Center, Houston, Texas. Several members of the Meteorological Chemistry Program are participating.

April 21-22: Southern Oxidants Study (SOS) Planning Meeting, Atlanta. Jim Meagher and Fred Fehsenfeld will attend.

April 27-May 1: 1998 Conference on Atmospheric Effects of Aviation, Virginia Beach, Virginia.

May 25-29: Spring Meeting of the American Geophysical Union, Boston. Several papers will be presented by members of AL.

June 1-5: Panel Review Meeting, WMO/UNEP *Scientific Assessment of Ozone Depletion: 1998*, Les Diablerets, Switzerland. Several AL staff members are participating as authors, contributors, reviewers, coordinating editor, cochair, and meeting support.

June 14-19: Gordon Conference on Solar Radiation and Climate, Plymouth State College, New Hampshire.

June 22-26: Joint Science Team Meeting, POLARIS/Observations of the Middle Stratosphere (OMS)/Stratospheric Tracers of Atmospheric Transport (STRAT), in Snowmass, Colorado. Members of the Meteorological Chemistry Program will attend.

June 22-26: Climate System Model Workshop, Breckenridge, Colorado. Members of the Middle Atmosphere Program will attend.

Upcoming AL Seminar Speakers: Adrian Matthews (April 22), David Rider (April 29), Margaret Lemone (May 6), Purnendu Dasgupta (May 20), Karsten Suhre (May 22), Graeme Stephens (May 27).

On the Air! is a quarterly publication of the NOAA Aeronomy Laboratory. Please send any comments, questions, and suggestions to: Chris Ennis (phone 303-497-7538; email cennis@al.noaa.gov).

